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Canadian Science Advisory Secretariat
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RECOVERY POTENTIAL ASSESSMENT REPORT ON WHITE SHARKS IN ATLANTIC CANADA

Context

In April 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Atlantic population of white sharks (Carcharodon carcharias) as endangered, and the government is now considering its addition to Schedule 1 under the Species at Risk Act (SARA). Decisions made on permitting of incidental harm and in support of recovery planning need to be informed by the impact of human activities on the species, alternatives and mitigation measures to these and the potential for recovery. An evaluation framework, consisting of three phases (species status, scope for human - induced harm and mitigation) has been established by DFO to allow determination of whether or not SARA incidental harm permits can be issued. This framework is used as a basis for decisions relating to the recovery planning of white sharks.

SUMMARY

- White sharks can migrate long distances, but their movements in the North Atlantic are poorly known. They are found only rarely in Canadian waters. Since 1874, a total of 34 white sharks have been recorded from eastern Canada.
- White shark abundance is declining worldwide. In the North Atlantic, there has been a sharp decline (between 59 and 89%) in white shark abundance between 1986 and 2000.
- Because of a lack of information on the abundance and productivity of the species, it is not possible to assess the potential for the recovery of the North Atlantic white shark population.
- The high incidence of white shark bycatch in the southern U.S. pelagic longline fleet (more than 400 captures per year on average between 1986 and 2000) appears to be the most significant source of fishery capture and mortality in the North Atlantic, and is not considered sustainable.
- The recovery potential in Canadian waters will be dependent on the overall recovery in U.S. and other North Atlantic waters.
- Given the very poor status of the population, any level of harm would jeopardize its survival or recovery. The only viable management option to enhance the recovery of white sharks in the Atlantic Ocean is the live release of captures.

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Canada

BACKGROUND

Rationale for Assessment

The Species at Risk Act (SARA) provides legal protection to species listed in Schedule 1 and it is anticipated that prohibitions under SARA will soon apply to white sharks in Canadian waters. Activities that would harm the species are prohibited and a recovery plan is required. Until such a plan is available, section 73(2) of SARA authorizes competent ministers to permit otherwise prohibited activities affecting a listed wildlife species, any part of its critical habitat, or the residences of its individuals. Under section 73(2) of SARA, authorizations may only be issued if:

(a) the activity is scientific research relating to the conservation of the species and conducted by qualified persons;
(b) the activity benefits the species or is required to enhance its chance of survival in the wild; or
(c) affecting the species is incidental to the carrying out of the activity.

Section 73(3) establishes that authorizations may be issued only if the competent minister is of the opinion that:

(a) all reasonable alternatives to the activity that would reduce the impact on the species have been considered and the best solution has been adopted;
(b) all feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals; and
(c) the activity will not jeopardize the survival or recovery of the species.

Decisions made on permitting of incidental harm and in support of recovery planning need to be informed by the impact of human activities on the species, alternatives and mitigation measures to these activities, and the potential for recovery. An evaluation framework, consisting of three phases (species status, scope for human–induced harm and mitigation) has been established by DFO to allow determination of whether or not SARA incidental harm permits can be issued. The analysis provided here will support decisions relating to the listing of white sharks and their recovery planning. In the context of this advisory report, "harm" refers to all prohibitions as defined in SARA.

Species Biology

Much of the biology of white sharks is poorly understood. They inhabit coastal and offshore waters from the subarctic to tropical regions, but do not enter brackish or freshwaters. They range from surface waters down to depths as great as 1280 meters. They tolerate a wide range of water temperatures (5 to 27°C), and can maintain body temperatures above the ambient water temperature. White sharks prey upon a variety of fishes and marine mammals.

White sharks are slow growing and have a relatively long life span (23-60 years). Males reach sexual maturity in 8 to 10 years and at lengths between 3.5 to 4.1 m, but females do not mature until they are 12 to 18 years old and between 4 and 5 m in length. White sharks are ovoviviparous with a gestation period of about 14 months. Females give birth to an average of 7 live pups and may only produce 45 pups in a lifetime. These life history characteristics imply that the white shark is a relatively unproductive species, comparable to porbeagle shark.

Circumstantial evidence suggests that the Mid-Atlantic Bight, between Cape May and Cape Cod, may be a mating area for white sharks on the east coast of North America.

The white shark is known to undergo long migrations, but its movements in the North Atlantic are poorly known. There appears to be only a single population (designatable unit; D.U.) in the Atlantic Ocean. Although rarely observed in Canada, they tend to be found in Canadian waters during the months of August and September.

ASSESSMENT

Trends and Current Status

White sharks are rare in Atlantic Canadian waters, but sightings or captures are reported every 2-3 years and 34 observations of white sharks were recorded from eastern Canada between 1874 and 2004. White sharks have been caught in the Bay of Fundy, off of southwest Nova Scotia, eastern Nova Scotia, southern Newfoundland, Prince Edward Island, and in the Gulf of St. Lawrence. There are only two records of white shark bycatch from the Scotia Fundy Observer Program between 1986 and 2006 compared to 6,087 white sharks recorded as bycatch in the U.S. pelagic longline fishery between 1986 and 2000. The majority (80%) of these U.S. records were from areas south of Florida. There are no estimates of white shark densities in Canadian waters, but the U.S. longline results in general, along with the observation that no white sharks have been reported from the U.S. longline fishing zones nearest to Canadian waters (Northeast Coastal and Northeast Distant Areas) since the early 1990s, strongly suggest that white sharks occur in very low numbers in Canadian waters and that densities are much lower than in southern U.S. waters.

There is limited information available to establish trends in population abundance of white sharks and none of it comes from Canadian waters. While there is no information on the status of the North Atlantic D.U., all available data suggest white shark numbers are declining worldwide. Analysis of U.S. longline bycatch data from the northwest Atlantic suggests a sharp decline (between 59 and 89%) in white shark numbers between 1986 and 2000 (Baum et al. 2003). Although the number of observations of white sharks in Canada has also declined greatly since 1930, consistent with the decline in U.S. waters, it is clear that Canadian waters are marginal habitat for white sharks, making the number of observations an unreliable index of abundance.

Recovery Reference Points

Reference points to characterize recovery have not been developed for white sharks. One possible recovery target is that proposed by the International Commission for the Conservation of Atlantic Tunas (ICCAT) (2005) as an approximation of maximum sustainable yield (MSY) for shortfin mako: one half the virgin spawning stock biomass (SSB_0). Although this is a very cautious recovery target, it is consistent with the Cautious-Healthy boundary of the Precautionary Approach Framework being established by DFO (DFO 2005a). There is insufficient data on white shark fishery catches, natural mortality and reproductive rates to develop models to estimate these reference points as was done previously for porbeagle sharks (DFO 2005b).

Recovery Potential

Because of a lack of information on the abundance and productivity of the species, it is not possible to assess the potential for the recovery of the North Atlantic white shark population. However, white shark abundance in Canada would in general follow the trajectory of the North Atlantic population, a component of which has declined in recent decades in U.S. waters. Therefore, the recovery potential in Canadian waters will be dependent on the overall recovery in U.S. and other North Atlantic waters. White sharks are now protected in the U.S. However, current levels of bycatch in the U.S. pelagic longline fishery are not considered sustainable (Baum et al. 2003). Shortcomings in monitoring, control and surveillance will have to be overcome for recovery to occur. There are no known sensitive habitats for white sharks in Canadian waters.

Sources of Uncertainty

A major source of uncertainty is the lack of information on the population biology of white sharks in Canadian and North Atlantic waters. Without information on white shark population biology and ecology (e.g., natural and human-induced mortality rates), it will not be possible to develop a population dynamics model for estimating white shark population status and productivity.

Although white sharks are suspected to have high levels of contaminants in their tissues, the effects of these contaminants are unknown.

Allowable Harm / Provisions of Recovery Plan

White sharks are rarely encountered by commercial or recreational fishers in Canada. Only 15 captures from commercial fishing gear have been authenticated in eastern Canadian waters between 1874 and 2004, and most of these were in herring weirs and gillnets. White sharks are rarely caught recreationally due to their scarcity, size and ability to bite through regular tackle. There are only two records of recreational catches of white sharks in Canadian waters since 1874. The high incidence of white shark bycatch in the southern U.S. pelagic longline fleet (more than 400 captures per year on average between 1986 and 2000) appears to be the most significant source of fishery capture and mortality in the North Atlantic.

Shark finning and sale of other shark body parts is considered to be one of the greatest threats to white and other sharks worldwide, but Canada banned all shark finning in 1993. Canada ratified a Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listing under Appendix II in 2004, so restrictions on trade of white shark products appear to be adequate in Canada.

As top predators, white sharks bioaccumulate chlorinated hydrocarbons and other contaminants in their tissues. Although it is possible that these contaminants are having an adverse effect on white shark physiology, there is no obvious means through which this contaminant load could be minimized.

Given the very poor status of the population, any level of harm would jeopardize its survival or recovery. Since white sharks are so rare in Canadian waters and since their capture is usually accidental, the only viable management option to enhance the recovery of white sharks in the Atlantic Ocean is the live release of captures.

CONCLUSIONS AND ADVICE

White shark abundance is declining both in the North Atlantic and worldwide, but none of the evidence comes from Canada. U.S. longline bycatch data from the northwest Atlantic indicates a sharp decline (between 59 and 89%) in white shark numbers between 1986 and 2000; it seems likely that Canadian numbers have followed a similar pattern.

White shark bycatch in the U.S. pelagic longline fleet appears to be the most significant source of fishery capture and mortality in the northwest Atlantic. Canadian sources of mortality appear to be insignificant.

Given the very poor status of the population, any level of harm would jeopardize its survival or recovery. Since white sharks are so rare in Canadian waters and since their capture is usually accidental, the only viable management option to enhance the recovery of white sharks in the Atlantic Ocean is the live release of captures.

SOURCES OF INFORMATION

Baum, J.K., R.A. Myers, D.G. Kehler, B. Worm, S.J. Harley, and P.A. Doherty. 2003. Collapse and conservation of shark populations in the Northwest Atlantic. Science 299:389–392.

DFO, 2005a. A Framework for Developing Science Advice on Recovery Targets for Aquatic Species in the Context of the Species At Risk Act. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/054.

DFO, 2005b. Recovery Assessment Report on NAFO Subareas 3 – 6 Porbeagle Shark. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/043.

ICCAT, 2005. Report of the 2004 inter-sessional meeting of the ICCAT sub-committee on by-catches: shark stock assessment. Col. Vol. Sci. Pap. ICCAT, 58: 891-934.

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